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Mouth Cancer Awareness in General Population: Results from Grampian Region of Scotland, United Kingdom

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ABSTRACT

Objectives: The purpose of this project was to determine the level of mouth cancer awareness and to investigate the associated factors in a United Kingdom (UK) general population sample.
Material and Methods: Adult Dental Health Survey (2010) was conducted in a sample of 3,353 adult residents in the Grampian region of the UK (adjusted participation rate 58%). Participants completed a questionnaire consisting of questions on oral health, health behaviour, quality of life and cancer awareness.
Results: Overall, 81% of participants were aware of mouth cancer. This was associated with younger age, higher levels of education and better general health. Current smokers and alcohol drinkers were more aware of mouth cancer. When asked about risk factors for mouth cancer, the following were identified by the respondents: smoking (84%), poor oral hygiene (60%), drinking alcohol heavily (59%), poor diet (37%), stress (15%), being overweight (6%), drinking hot liquids (5%), eating spicy food (3%), using mouthwash (2%) and kissing someone (1%). Smokers were more likely to identify smoking as a risk factor for mouth cancer. Similarly, those who consumed alcohol almost daily were more likely to identify heavy alcohol drinking as a risk factor.
Conclusions: Awareness of mouth cancer is high in respondents from the general population, and participants were able to identify the most important risk factors. Knowledge of tobacco and alcohol as risk factors was highest amongst those exposed to them. The study proposed that the prevention strategies should focus not only on increasing knowledge, but also on changing health behaviour.

Keywords: alcohol drinking; awareness; mouth cancer; risk factors; tobacco.

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INTRODUCTION

Head and neck (HNC) cancers is a collective term which encompasses malignancies of oral cavity, pharynx, larynx, sinuses and salivary glands. Oral and pharyngeal cancer (OPC) is the 8th most common malignancy in Europe and the 11th cause for cancer mortality [1]. It has a heterogeneous distribution and projected incidence of 121,300 new cases in the continent in 2018 [2]. Estimated numbers of deaths from OPC in Europe in 2018 is 41,400 in males and 11,800 in females [2]. In the United Kingdom (UK), there were 12,061 new HNC cases in 2015 and 4,047 related deaths in 2016 [3,4]. Scotland, with 1,289 cases, exhibits the highest HNC incidence rate in the UK at 24.6 (European age-standarised/100,000 population). Values for Northern Ireland, Wales and England have been estimated to be 22.5, 21.9 and 19.2, respectively [3].

Major risk factors for OPC cancer are tobacco consumption, heavy alcohol drinking and poor nutrition - specifically lower fruit and vegetable consumption [5-7]. Human papilloma virus (HPV) infection, poor oral hygiene and dentition, genetic factors and alcohol in mouthwashes have also been suggested to play a causal role [8-11].

To the best of our knowledge there are only two large studies conducted in the UK which have investigated the public awareness of OC and the associated risk factors, and these have yielded conflicting results. While one of the surveys conducted in 1995 by Warnakulasuriya et al. [10] reported an alarming lack of OC awareness with only 56% of the participants being aware, the later survey conducted in 2001 by West et al. [12] reported that 96% of respondents were aware of mouth cancer. Furthermore, the majority (85%) of respondents recognised smoking as a risk factor, however only 19% recognised frequent alcohol consumption as such [12].

The purpose of this project was to determine the level of mouth cancer awareness in a general population sample in Scotland.

MATERIAL AND METHODS

The Grampian Adult Dental Health Survey (GADHS) was conducted in the Grampian region of Scotland between October 2009 and January 2010, and aimed to evaluate current state of oral health, access to dental care and a range of related behaviours [13]. There was a delay in publishing these results due to study investigators retiring or relocating.

This epidemiological survey was approved by the Grampian National Health Service (NHS) Board. An age-, gender- and area-stratified random sample of 6,000 people aged 25 years and over was selected from the Community Health Index (CHI) database. The CHI database contains details of all Scottish residents registered with a General Medical Practitioner. NHS Grampian had previously undertaken a youth and young people lifestyle survey [14], and therefore 16 to 24-year olds were not sampled.

Each selected individual received a postal questionnaire which consisted of 51 questions on socio-demographic characteristics (age, gender, and education), oral health, health-related behaviours and utilisation of dental services. A follow-up of non-responders was performed initially with a reminder postcard, a further questionnaire, and finally where necessary, a short questionnaire. The short questionnaire consisted of 10 key questions on dental services utilisation and number of teeth. Deprivation was measured using the Scottish Index of Multiple Deprivation (SIMD) 2009 (http://www.scotland.gov.uk/Topics/Statistics/SIMD/), which was obtained from the participants' postcodes. The SIMD gives a relative measure of deprivation by providing a relative ranking, with most and least deprived ranked as "1" and "5", respectively.

Participants were asked whether they had heard of eight types of cancer (lung, skin, breast, mouth, cervical, prostate, bowel and throat) and to identify which factors might cause mouth cancer. They were given 10 options: drinking alcohol heavily, poor diet, poor dental hygiene, using mouthwash, being overweight, stress, smoking, drinking hot liquids, kissing someone and eating spicy food.

Information pertaining to the participants' socio-demographic characteristics, general, dental and oral health, smoking, alcohol consumption, dental check-ups and mouthwash use was obtained as a part of the study.

Statistical analysis

Statistical analysis involved descriptive tables, Chi-square test and Cox regression [15]. The magnitude of association between a factor and mouth cancer awareness was described by the relative risk (RR). Data were analysed using Stata 11 for Windows (StataCorp, 2009) and IBM SPSS Statistics version 19 (2010, SPSS INC, an IBM company) statistical packages.

RESULTS

A total of 3,022 full and 331 short questionnaires were returned. Of the remainder, 250 subjects were assumed not to have received the questionnaire, either because notification was received from the occupants or post office that the subject had moved (n = 205), they were severely disabled/terminally ill (n = 2) or had died (n = 30). This resulted in an adjusted participation rate of 58.2%. Participation rate was highest in the age group 55 - 64 (68.5%) and lowest in those aged 25 - 34 (47.3%). The lowest participation rate was among the most deprived participant (SIMD Quintile 1, 44.6%) and the highest in more affluent (60.7% in quintile 4 and 60.4% in quintile 5).

The most commonly identified cancer was cancer of the breast (88.1%) followed by cancer of lung (87.3%), skin (87.3%), bowel (87.3%), prostate (87.2%), cervix (86%), throat (84.6%) and mouth (81%).

Overall, 81% of all the participants were aware of mouth cancer. Mouth cancer awareness was related to age with participants aged 75 years or over being the least aware (67.7%) (test for trend P < 0.001), deprivation (test for trend P = 0.034), better general health (test for trend P < 0.001), self-reported oral health (test for trend P = 0.016) regular dental check-ups (test for trend P < 0.001), mouthwash use (test for trend P = 0.034), higher number of natural teeth (test for trend P < 0.001) and education with participants from primary and secondary school education only being less aware (78.4%) (test for trend P < 0.001). Among 46 people who reported their level of education as only primary school, 26 (56.5%) were male, 37 (80.4%) were aged 65 years or older and 30 (65.2%) lived in remote small towns or rural locations.

On univariate analysis, there was no significant association found with gender (Chi-square test P = 0.065), rurality (test for trend P = 0.3) or geographical area (Chi-square test P = 0.475). Mouth cancer awareness was related to smoking (test for trend P = 0.004) with current smokers being the most aware of mouth cancer (87.2%) and alcohol consumption (test for trend P < 0.001) with participants who did not drink being the least aware (73.5%) (Table 1 and 2).

When factors significant on univariate analysis were considered in multivariate analysis, adjusted for age and gender, the best predictors of mouth cancer awareness were gender, education, smoking, alcohol consumption and number of teeth (Table 3).

When asked about risk factors for mouth cancer the following were identified from the suggested list: smoking (84.2%), poor oral hygiene (60%), drinking alcohol heavily (58.8%), poor diet (37.4%), stress (15.2%), being overweight (6.2%), drinking hot liquids (5%), eating spicy food (2.7%), using mouthwash (2.3%) and kissing someone (1.1%) (Table 4). In addition, one respondent identified HPV as a risk factor for mouth cancer (however no dedicated space for open suggestions were provided in the questionnaire).

Table 1. Knowledge of mouth cancer by socio-demographic characteristics

Factor	Total number in group	Aware number (%)	Statistical test (P-value)[a]
Age			
25 - 34	460	379 (82.4)	Test for trend (< 0.001)
35 - 44	605	504 (83.3)	
45 - 54	470	407 (86.6)	
55 - 64	545	455 (83.5)	
65 - 74	527	424 (80.5)	
75+	415	281 (67.7)	
Gender			
Male	1438	1146 (79.7)	Chi-square test (0.065)
Female	1584	1304 (82.3)	
Education			
Primary school	46	23 (50.0)	Test for trend (< 0.001)
Secondary school	1354	1074 (79.3)	
Technical college	787	671 (85.3)	
University/postgraduate	781	647 (82.8)	
Deprivation (SIMD Quintile)			
1 (most deprived)	120	92 (76.7)	Test for trend (0.034)
2	334	255 (76.3)	
3	764	624 (81.7)	
4	987	809 (82.0)	
5	817	669 (81.9)	
Urban/rural			
Large urban	712	571 (80.2)	Test for trend (0.3)
Other urban	481	393 (81.7)	
Accessible small town	280	219 (78.2)	
Remote small town	272	218 (80.1)	
Accessible rural	867	709 (81.8)	
Remote rural	410	339 (82.7)	
Geographical area			
Aberdeen city	771	623 (80.8)	Chi-square test (0.475)
Aberdeenshire north	738	585 (79.3)	
Aberdeenshire south	729	597 (81.9)	
Moray	784	644 (82.1)	

[a]Level of statistical significance P < 0.05.
SIMD = Scottish Index of Multiple Deprivation.

Table 2. Knowledge of mouth cancer by health-related characteristics

Factor	Total number in group	Aware number (%)	Statistical test (P-value)[a]
Self-reported general health			
Excellent	671	559 (83.3)	Test for trend (< 0.001)
Good	1732	1440 (83.1)	
Fair	459	340 (74.1)	
Poor	83	64 (77.1)	
Self-reported oral health			
Excellent	340	288 (84.7)	Test for trend (P = 0.016)
Good	1575	1291 (82)	
Fair	741	599 (80.8)	
Poor	246	189 (76.8)	
Dental check-up			
Less than 1 year ago	2017	1691 (83.4)	Test for trend (< 0.001)
1 - 2 years ago	283	226 (79.9)	
3 - 4 years ago	164	129 (78.7)	
5 - 10 years ago	197	151 (76.7)	
Over 10 years ago	300	224 (74.7)	
Number of teeth			
No natural teeth	356	265 (74.4)	Test for trend (< 0.001)
< 10	225	163 (72.4)	
10 - 19	522	408 (78.2)	
20 or more	1859	1587 (85.4)	
Mouthwash use			
Daily	646	551 (85.3)	Test for trend (P = 0.034)
Once every few days	499	415 (83.2)	
Less than once a month	449	374 (83.3)	
Never	980	795 (81.1)	
Smoking			
Current smoker	553	482 (87.2)	Test for trend (0.004)
Used to smoke	779	634 (81.4)	
Never smoker	1530	1240 (81)	
Alcohol consumption			
Almost every day	320	275 (85.9)	Test for trend (< 0.001)
Once or twice a week	1045	881 (84.3)	
Less than once a week	1014	829 (81.8)	
Does not drink	551	405 (73.5)	

[a]Level of statistical significance P < 0.05.

Table 3. Multivariate model of mouth cancer unawareness

Factor	Rate ratio (95% CI)[a]
Gender	
Male	1
Female	0.8 (0.67; 0.97)
Education	
University/postgraduate	1
Technical college	0.81 (0.62; 1.05)
Secondary school	0.95 (0.75; 1.2)
Primary school	1.83 (1.08; 3.1)
Smoking	
Never smoker	1
Used to smoke	0.91 (0.73; 1.13)
Current smoker	0.6 (0.45; 0.8)
Alcohol consumption	
Does not drink	1
Less than once a week	0.83 (0.64; 1.06)
Once or twice a week	0.7 (0.54; 0.91)
Every day	0.69 (0.48; 1)
Number of teeth	
20 or more	1
10 - 19	1.49 (1.13; 1.97)
< 10	1.78 (1.25; 2.55)
No natural teeth	1.69 (1.21; 2.35)

[a]Rate ratio of being UNAWARE of mouth cancer estimated from Cox regression model adjusted for age. All variables are in the same model. For example, participants with no natural teeth were 1.69 times more likely to be UNAWARE of mouth cancer compared to those who have 20 or more natural teeth.
CI = confidence interval.

Table 4. Distribution of participant-identified risk factors for mouth cancer

Characteristic	% identified characteristic as a risk factor for mouth cancer
Smoking	84.2
Poor oral hygiene	60
Drinking alcohol heavily	58.8
Poor diet	37.4
Stress	15.2
Being overweight	6.2
Drinking hot liquids	5
Eating spicy food	2.7
Using mouthwash	2.3
Kissing someone	1.1

Table 5. Relationship between potential risk factors for mouth cancer and recognising them as risk factors

Characteristic	% identified characteristic as a risk factor for mouth cancer	Chi-square test P-value[a]
Smoking	Smoking is a risk factor	0.016
Current smoker	89.3	
Used to smoke	84.9	
Never smoker	84.4	
Alcohol consumption	Heavy alcohol consumption is a risk factor	< 0.001
Every day	66.6	
Once or twice a week	63.3	
Less than once a week	56.3	
Does not drink	52.1	
Mouthwash use	Mouthwash is a risk factor	0.085
Daily	1.7	
Once every few days	1.8	
Less than once a month	2.2	
Never	3.5	
Oral Health	Poor oral health is a risk factor	0.783
Excellent	61	
Good	60.2	
Fair	62.5	
Poor	61	
Dental check-up	Poor oral health is a risk factor	0.033
Less than 1 year ago	62.1	
1 - 2 years ago	63.3	
3 - 4 years ago	61	
5 - 10 years ago	55.8	
Over 10 years ago	53.7	
Number of teeth	Poor oral health is a risk factor	< 0.001
No natural teeth	51.7	
< 10	56	
10 - 19	62.6	
20 or more	62.8	

[a]Level of statistical significance $P < 0.05$.

Current smokers were more likely to identify smoking as a risk factor for mouth cancer ($P = 0.016$). Similarly, those who consumed alcohol almost daily were more likely to identify heavy alcohol drinking as a risk factor ($P < 0.001$). Participants with the most recent dental check-up over 5 years ago and those with less than 10 natural teeth were less likely to identify poor oral health as a risk factor (Table 5).

DISCUSSION

This survey found that awareness of mouth cancer was high in respondents from the general population. The results are similar to those reported by West et al. [12], and show 25% higher OC awareness than the level (56%) determined by the study of Warnakulasuriya et al. [10] in 1995. It is possible that the level of awareness was higher than reported here. The awareness was assumed if respondents ticked a relevant box in the questionnaire. It is plausible that some participants did not tick all possible boxes rather than being unaware, for example, of lung cancer. In fact, there were 310 participants who did not tick any of the boxes. Assuming they missed the question completely, lung cancer awareness would change from 87.3% to 97.3%.

While the participation rate achieved in the current survey was 58%, the historic rates in this geographical location varied from between 25% and 82% [16-18]. The difference between the previous high response level and the value achieved presently could be attributed to forgetfulness, participants' disinterest in the survey topic [19] or the new requirement to provide prior consent to receive a postal questionnaire [18].

Regular consumption of alcohol and tobacco smoking have been identified as the main, yet preventable, causes for cancers of the upper aerodigestive tract (UADT) [12,20-22]. West et al. [12] reported that members of the general public who were more likely to be unaware of mouth cancer were characterised by: older age, low occupational status, no history of tobacco use or frequent alcohol consumption. In our study current smokers and alcohol users were more aware of mouth cancer. They were also more likely to identify smoking and heavy alcohol drinking as risk factors for mouth cancer. A possible explanation is that people tend to remember information which carries a direct personal relevance. Although even a limited exposure to tobacco products constitutes a risk factor for oral cancer, low doses of alcohol might not necessarily pose a similar threat to individual's health [12]. Future questionnaires may seek to establish not only the frequency, but also the quantity of alcohol intake.

To the best of our knowledge, the present study is the first one to investigate the public perception of potential risk factors for oral cancer such as poor oral hygiene, nutritional deficiencies, high body mass index (BMI), mouthwash use and stress.

Previous research has indicated that there is a positive relationship between poor oral hygiene and cancer of the head and neck, including oral and oropharyngeal squamous cell carcinoma [23-28]. Our study shows that 60% of the participants were aware of the association between poor oral hygiene and oral cancer. This awareness was significantly higher in people with better oral health and dental care behaviour as indicated by the number of natural teeth present ($P = 0.033$) and frequency of dental check-ups ($P < 0.001$) (Table 5). The results may be associated with the oral hygiene education which patients receive during their examination appointments. The current study thereby highlights the important role of the dental team in mouth cancer prevention.

The importance of diet for good health and general well-being is being increasingly recognised. In particular, consumption of fresh fruit and non-starchy vegetables has been associated with decreased cancer risks, while diet rich in red and processed meat has been linked to elevated risks [21,29,30]. The present study shows that 38% of the respondents indicated that poor diet presents a risk factor for oral cancer. A future survey may include more specific questions relating to different eating habits in order to better understand the public awareness of the association between diet and cancer.

Fifteen percent of participants stated that 'stress' may lead to an increased risk of OC. A physiological theory of 'stress' was developed at the beginning of the 20th century [31]. This provided a potential link between the central nervous system and the release of hormones with inhibitory effects on the immune cells [32]. Although some studies did not support a direct relationship between the adverse life events and the onset of cancer [33], others have indicated that a reduction in stress levels contributed to a decreased rate of metastasis and prolonged survival time [34].

Being overweight was recognised as a malignancy risk factor by 6.2% of the respondents. Rates of weight gain and obesity (high BMI) have increased 2-fold in many developed economies between 1990 and 2005 [21]. Evidence has shown that being obese elevates the risks for type 2 diabetes, hyperlipidaemia, and certain types of cancers [21]. As both the consumption of calorie-dense food and inadequate food intake can result in deficiency of micronutrients, it can be speculated that the actual nutritional status of an individual has an additional bearing on the cancer risk [35,36]. Future studies should integrate individual BMI analysis, biochemical and epidemiological investigations as well as personal nutritional profile.

Our study found that 5% of respondents considered drinking hot liquids to be a risk factor for mouth cancer. In a comprehensive review of the available evidence the World Cancer Research Fund and the American Institute for Cancer Research [21] did not find sufficient evidence to indicate that tea and coffee increase the risk of cancer. However, the consumption of beverages at very high temperature may be associated with such risks [21,37,38]. A notable example is maté, a South American drink, which is drunk traditionally at scalding temperatures through a metal straw, and has been linked to increased risks of oesophageal cancer [21,37,39]. Taking into consideration that hot beverages are consumed daily by the public further research to fully establish the potential role of thermal irritation of the epithelium and UADT cancer is warranted.

A small proportion of the respondents in our study (2.7%) were of the opinion that eating spicy food presents a risk factor for mouth cancer. Certain foods contain phytochemicals which give them distinctive spicy flavour, for instance isothiocyanates in mustard and horseradish, sulphides in garlic and chives, and terpenoids in herbs and spices [21]. There is not much

evidence suggesting that these compounds increase the risks of cancer. Indeed there are data suggesting potentially beneficial effects in the cases of many herbs and spices such as ginger, saffron and turmeric [21,40]. Therefore, it is possible that the participants in our study who considered eating spicy food to be a risk factor for mouth cancer may have simply associated the hot/spicy sensation with potentially harmful effects rather than providing their answer on the basis of prior knowledge or evidence.

Only 2.3% of respondents were of the opinion that using mouthwash presents a risk factor for mouth cancer. At present the research evidence on the issue is controversial. Some studies have reported similar oral cancer risks among mouthwash users and non-users [41-46] while other studies have reported that mouthwash use is associated with significantly increased risks of developing malignancy [11,26,47,48]. It should be noted that positive association between mouthwash use and increased risks of oral cancer appears to be found mainly with alcohol containing mouthwashes [11]. As mouthwash is a product which supplements daily dental hygiene [13,48], it is imperative that the issue of whether mouthwash can increase the risks of oral cancer is resolved.

Infection with HPV has been recognised as a risk factor for oral and oropharyngeal cancer [45]. In a hospital-based case-control study D'Souza et al. [49] demonstrated that oropharyngeal cancer was significantly associated with HPV infection, regardless of the patients' alcohol and tobacco use. Although research evidence suggests that HPV infection is likely to be sexually acquired, the possibility of mouth-to-mouth transmission is also being considered [50]. In our study 1.1% of participants identified "kissing someone" as a potential risk factor for mouth cancer. This highlights the importance of further research to fully establish the association between viral infection and OC. Furthermore, public awareness of the risks should be raised through campaigns similar to those addressing HPV and cervical cancer.

Earlier UK surveys found that public knowledge of initial signs of OC was relatively low [12,51]. A survey conducted in the US indicated that 66% of respondents were not familiar with head and neck cancer, only 55% recognized tobacco smoking as a risk factor and few had knowledge of potential signs and symptoms of OC [52]. Public awareness of risk factors, signs, and symptoms of oral malignancies facilitates early detection and thereby improves the treatment outcomes [53]. This is particularly important for high-risk individuals such as tobacco and alcohol consumers, and people who are not routinely attending dental examinations. Such individuals might present to a hospital with the disease in an advanced stage which may negatively affect the prognosis and the range of available treatment options [54].

While increasing public awareness of risk factors, signs and symptoms of OC would be beneficial for its early detection, adequate education of health-care providers is critical in this respect [55,56]. A study by Tanriover et al. [57] showed that nearly 30% of primary care physicians did not ask patients about tobacco consumption, and more than 45% did not make enquiries about alcohol consumption. Furthermore, the physicians were of the belief that they did not receive adequate smoking cessation training (69.5%) and alcohol cessation training (79.9%) [57]. A cross-sectional survey conducted by Ahluwalia et al. [58] showed that the majority of GP training programmes in the UK did not include structured training in relation to oral health care and OC detection. Another cross-sectional study conducted in Brazil showed that most primary care dentists were unable to identify potentially malignant lesions and to perform biopsy [53]. Furthermore, Wolever et al. [59] argued that the primary healthcare providers should have a dedicated time and adequate resources in order to concentrate on helping patients to alter their lifestyle. Achieving long lasting behavioural changes requires an ongoing professional support using evidence based interventions.

CONCLUSIONS

Awareness of mouth cancer is high in respondents from the general population and participants were able to identify the most important risk factors. Knowledge of tobacco and alcohol as risk factors was highest amongst those exposed to them. This study suggested that preventative programmes should focus not only on increasing individual's knowledge, but also on changing their health behaviour.

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